Title: Improved Powered Umbrella

Abstract of the Disclosure

This invention relates to umbrellas in general. In particular it relates to umbrellas which automatically open and close. This automatic opening and closing of the umbrella in the presented embodiments is accomplished by means of the rotation of a threaded rod driven by an electric motor which is, in turn, driven by battery power.

The improvement disclosed herein relates to a means for increasing the number of times a that an umbrella may be opened and closed using one charge of a battery and ensuring the reliability of the opening and closing mechanism.

Background Art

It is known in the art to construct umbrellas which open automatically with the manual release of a catch wherein the compression of a spring causes a hollow member, to which the ribs of the umbrella are attached, to move along a shaft extending through the hollow member. It is also known in the art to provide means for the biasing the umbrella closed by the action of a spring. However, the umbrellas of the art in general require the movement of the hand from one position to another in order to effect closing or even worse require the use of two hands. Alternatively, or coincidentally, the user of such umbrellas which use springs to automatically open and close must remember to compress the spring each time before using the umbrella. Without this prior spring compression such existing umbrellas cannot even be opened, let alone closed.

In addition, umbrellas have previously been disclosed in the art which rely upon an electric motor powered by a battery to open and close the umbrellas. These umbrellas, however, suffered from the fact that the umbrella could only be opened and closed a relatively small number of times from one charge of a battery and from a reduced reliability in the opening and closing mechanism.

Description of Drawings

Figure 1 contains a sectional view of the umbrella mechanism which is provided with specific means for conserving battery power, wherein the umbrella ribs are shown in the open or extended position.

Figure 2 presents in sectional view Detail A-A of Figure 1

Figure 3 presents in sectional view Detail B-B of Figure 1.

Figure 4 presents in sectional view Detail C-C of Figure 1.

Figure 5 contains a sectional view of an umbrella mechanism which is provided with specific means for conserving battery power, wherein the umbrella ribs are shown in the partially closed position.

Figure 6 contains a Detail D-D of Figure 4.

Figure 7 contains a Detail E-Eof Figure 4.

Figure 8 contains a Detail F-F of Figure 4.

Figure 9 contains a sectional view of an umbrella mechanism which is provided with specific means for conserving battery power, wherein the umbrella ribs are shown in the fully closed or carrying position.

Figure 10 contains Detail G-G of Figure 9.

Figure 11 contains Detail H-H of Figure 9.

Figure 12 contains Detail I-I of Figure 9.

Be it known that for clarity of presentation, in Figures herein in which the cloth 5 and the ribs 1 are depicted, that the multiplicity of ribs 1, and struts 2 are represented by only two such ribs 1 and struts 2, while the cloth 5, is represented in sectional view only by two parallel lines.

In Figure 1 can be seen umbrella ribs 1, held in an open position by umbrella struts 2, wherein umbrella ribs 1, are pivotally attached to end piece 3, wherein end piece 3, is affixed to cylindrical shaft 4, in such a manner that end piece 3 freely rotates relative to cylindrical shaft 4, and yet is not readily separated from cylindrical shaft 4, this attachment being accomplished by various means known to those skilled in the art of mechanical devices.

Strut 2, is pivotally attached to rib 1, at one end and strut 2, is pivotally attached at its opposite end to collar 6. Ribs 1 are covered by cloth 5.

Figure 1 depicts the improved umbrella embodiment in the fully open position in which the opening of the improved umbrella , has been accomplished. The opening of the improved umbrella was accomplished by the upward movement of a collar 6 by means of pin 7 extending through shaft slot 8, in cylindrical shaft 4, and engaging the threads of threaded rod 9, and threaded rod 9 rotated in one direction.

The location and extent of shaft slot 8, is shown in Figure 1 and in the sectional views of the Figures that follow by the absence of crosshatching in the cross-sectional view of cylindrical shaft 4.

As shown in Figure 1, the rotating shaft of the bidirectional electric motor 10, is attached to the lower end of hex drive socket 11. Hex drive socket 11, is, in turn, attached to hex drive shaft 9 which is, in turn, attached to threaded rod 9. The bidirectional electric motor 10, is attached by means of motor support 13, to the handle, 14. By means of electric circuitry commonly known in the art of electronics the potential energy stored in battery 15, can be used to make, with the movement of position switch 16, to one of its available positions, the shaft of the bidirectional electric motor 10, to rotate in a given direction causing the upward or downward motion of collar 16. Movement of the position switch 16, to yet another position can be made to effect the rotation in the opposite direction of the shaft of electric motor 10. This, of course, causes movement of collar 6, in a direction opposite to that previously induced. In this manner the umbrella can be made to open and close automatically, where the open position of the umbrella is shown in Figure 1, the partially closed position is shown in Figure 5 and a fully collapsed postion shown in Figure 9.

Figure 1 further shows the threaded rod 9, to have an uppermost threadless section, 16, which has been formed on the threaded rod 9, on its upper most end, wherein this uppermost threadless section 16, is devoid of threads so that even though threaded rod 9 continues to be rotated the pin 7 and consequently collar 6, will not be urged further upward beyond the threadless section 16. In the fully open position the pin 7 rests on the upper most end of the threads on threaded rod 9 and keeps the umbrella in an open position.

However, when the direction of rotation of the bidiretional electric motor 10 is reversed, which reverses the direction of rotation of threaded rod 9, from the direction of rotation of the rod 9 used to open the umbrella, the collar 6 will progress downward on the threaded rod 9, to the lowermost end of threaded rod 9 and thereby close the umbrella.

There may be additionally provided at the lowermost end of the threaded rod 9, a lowermost threadless section 17, wherein the threaded section of the threaded rod 9 lies between the uppermost threadless section 16 and the lowermost threaded section 17. This lowermost threadless section 17, is likewise not provided with threads but smooth in circumference. This lowermost threadless section 17, serves a function similar to those provided by the uppermost threadless section 16 in that when

the pin 7 has progressed downward to this lowermost threadless section 17, the collar 6, which is attached to pin 7 will not be urged further downward beyond the lowermost threadless section 17 by continued rotation of the threaded rod 9.

The spring 18, shown in Figure 1 encircles the lowermost threadless section 17. The inner diameter of the spring 18, is slightly larger than the diameter of the lowermost threaded section. Between the spring 18 and threaded section of threaded rod 9, there is optionally provided a washer 19. The outer diameter of the washer 19 is as large as or larger than the major diameter of the threaded section of threaded rod 19. The inner diameter of the washer 19 is slightly larger than the diameter of the lowermost threadless section so that when pin 7 is urged downward to the lowermost threadless section 17, the spring 18 will exert pressure against the washer 19. The washer 19 will, in turn, exert pressure against the pin 7 and thereby hold the pin 7, against the lower end of the threaded section of the threaded rod 9.

Hex drive shaft 12, slides up and down within drive shaft socket 11. However, the outer circumference of hex drive shaft 12 and the inner circumference are also configured such that when drive shaft socket 11 is made to turn by the rotation of the output shaft of bidirectional motor 10, the hex drive shaft 12 also turns.

As shown in Figure 1 hex drive shaft 12, is fully inserted into the drive shaft socket 11 during and following the opening of the umbrella. This is more clearly shown in Figure 4 which is an enlarged view of detail C-C in Figure 1.

The spring 18 is situated so that it is compressed upon movement of the pin onto the lowermost threadless section 17, and is of sufficient strength to keep pin 7 urged upward toward the threaded portion of threaded rod 9 and hence allows smooth restarting of the pin 7 on the threaded rod 9 when the bidirectional electric motor 10 is actuated in the direction required to open the umbrella

Further, in Figures 1 there is shown attached to the cylindrical shaft 4, an upper bearing 20. Adjacent to the uppermost threadless section of threaded rod 9 is a section of reduced diameter 21 on threaded rod 9. This area of reduced diameter rotates within upper bearing 20.

The threaded rod 9 turns freely by virtue of the upper most bearing 20. Hex drive shaft socket 11 transfers motive power from bidirectional electric motor 10 to threaded rod 9, while motor support 13 insures adequate support of bidirectional motor 10 and attaches it to handle 14.

Figure 2 is an enlargement of Detail A-A in Figure 1 which more clearly illustrates the resting of pin 7 against the uppermost threaded length of threaded rod 9 when the umbrella is in the open position. Figure 2 also shows more clearly that pin 7 is connected to collar 6, and struts 2 are connected to collar 6.

Figure 3, which is an enlargement of Detail B-B in Figure 1 which illustrates that when the umbrella of this invention is in the open position, the spring 18 is in an extended position and serves to urge the washer 19 toward or against the threaded section shown of threaded rod 9.

Figure 5 illustrates the relative position of the various parts of the umbrella following the movement of the position switch 16 to a position which causes the bidirectional electric motor 10, to rotate threaded rod 9 in the direction which causes the pin 7 to progress downward on the threaded section of threaded rod 9 to the lowermost threadless section of threaded rod 9. Once pin reaches the lowermost threadless section of threaded rod 9, it pushes against washer 19 and partially compresses spring 18. This compressive force exerted by spring 18 holds pin 7 against the threads on the threaded section of threaded shaft 9 which facilitates the re-engagement of the pin 7 in the threads of the threaded section of threaded rod 9 when the threaded shaft 9 is rotated by the action of bidirectional electric motor 10 in the direction which causes the pin 7 to move upward in the opening of the umbrella.

The relative position of the various parts of the spring 18, washer 19, pin 7 and the threaded rod 9 are more clearly show in Figure 7, which is an enlargement of Detail E-E in Figure 5.

Figure 6, which is an enlargement of Detail D-D in Figure 5 illustrates that rotation of the threaded rod 9 in the direction required to progress the pin 7 downward to close the umbrella has forced the threaded shaft 9 upward so that the section of reduced diameter 21 has moved further into the opening in bearing 20 until the edge of the uppermost threadless section 16 comes to rest against the bearing 20.

Similarly, Figure 8, which is an enlargement of Detail F-F in Figure 5, illustrates that hex drive shaft 12, has moved upward in the drive shaft socket 11 with the rotation of threaded shaft 9 in the direction required to force pin 7 and collar 6 upward in the opening of the umbrella of this invention. However, hex drive shaft 12 is still contained within drive shaft socket 11.

Figure 9 illustrates the umbrella of this invention when the ribs 1 are in the fully collapsed position as a result of being manually compressed further toward the cylindrical shaft 4 as compared with the position shown in Figure 5 of the ribs 1, where in Figure 5 the umbrella has only been closed to the extent achieved by the rotation of threaded rod 9 such that pin 7 becomes lodged between washer 9 and the lowermost edge of the threaded section of threaded rod 9.

Figure 10, which is an enlargement of Detail G-G in Figure 9, more clearly illustrates that in the fully collapsed position of the ribs 1 and cloth 5, section of reduced diameter 21 of threaded rod 9, move downward slightly relative to the position of the section of reduced diameter 21 shown in Figure 6. However, in Figure 10 the section of reduced diameter 21 of

threaded rod 9 is not in the lowest position which the section of reduced diameter 21, shown in Figure 2 which it attains when the umbrella of this invention is in the process of being opened by the action of the bidirectional electric motor 10.

Figure 11, which is an enlargement of Detail H-H in Figure 9, shows that in the fully collapsed position of the umbrella of this invention, the pin 7 is still lodged between the washer 9 and the lowermost edge of the threaded section of threaded rod 9 as it is in Figures 5 and 7 where in Figures 5 and 7 the umbrella has only been closed to the extent achieved by the rotation of threaded rod 9 such that pin 7 becomes lodged between washer 9 and the lowermost edge of the threaded section of threaded rod 9.

Figure 12, which is an enlargement of Detail I-I in Figure 9, shows that in the fully collapsed position of the umbrella of this invention, hex shaft 12 is more fully inserted into the drive shaft socket 11 compared to the position of hex shaft 12 in Figures 5 and 7 where in Figures 5 and 7 the umbrella has only been closed to the extent achieved by the rotation of threaded rod 9 such that pin 7 becomes lodged between washer 9 and the lowermost edge of the threaded section of threaded rod 9. However, the hex shaft 12 is not in the lowest position which the hex shaft 12 assumes, shown in Figures 1 and 4 which it attains when the umbrella of this invention is in the process of being opened by the action of the bidirectional electric motor 10.

Thus, when the bidirectional electric motor 10 is actuated to rotate threaded rod 10 in the direction required to open the umbrella of this invention, the hex shaft 12 will be forced downward into the position shown in Figure 4, as the pin 7 is re-engaged with the threaded section of threaded rod 9. However, at the start of the rotation of bi-directional motor 10, before the hex shaft 12 attains the position shown in Figure 4, the bidirectional electric motor 10, will not be pushing against pin 7. This reduces the amount of starting torque which must be supplied required by bi-directional motor 10 and therefore reduces the amount of current which the bi-directional motor 10 requires at the start of its rotation. This reduction in the amount of current required in the starting of bi-directional motor 10 reduces the battery requirements.

It can also be seen that, similarly, when the umbrella of this invention is in the open position shown in Figure 1 that upon actuation of the bi-directional electric motor 10 and therefore the threaded rod 9 in a direction which moves to close the umbrella, the initial rotation of the bidirectional electric motor 10, will force the threaded rod 9 upward until it attains the position shown in Figures 5 and 6. However, until the threaded rod 9 reaches the position shown in Figures 5 and 6, the bidirectional electic motor will require a reduced amount of current since it is only supplying the force required to move the threaded rod 9 upward until the threaded rod 9 reaches the position shown in Figure 6 during the opening of the umbrella. When the threaded rod 9 reaches the position shown in Figure 6 during opening of the umbrella, the bidirectional electric motor will then be required to supply the force required to move the pin 7 and the collar 6 downward. Thus during the closing of the umbrella of this invention as in the opening of the umbrella, the initial current requirements for the bidirectional electric motor

will be reduced and the bidirectional electric motor 10 will already be turning when the larger load of actually moving the pin 7 up or down is placed upon it during both the opening and the closing of the umbrella.

An additional benefit of the umbrella of this invention is that allowing the threaded rod 9 and hex shaft 12 to move upward and downward rather than be fixed between two points is that it aids in keeping pin 7 positioned between the lowermost edge of the threaded section of threaded rod 9 and the washer 9 when the umbrella of this invention is in the collapsed position. This ensures that the umbrella will correctly open when the bidirectional electric motor 10 is actuated by position 16 in the direction required to open the umbrella.

It must be understood that washer 9 is only an option and the spring 18 could itself contact the pin 7 and hold it against the lowermost edge of the threaded section of threaded shaft 9. Washer 9 simply allows the use of springs which have not been ground smooth and thus allows a greater range of variation in the construction of spring 9.

It is expressly within the scope of the invention disclosed in Figures 1 thru 12 that gearing or a gearbox which increases or decreases the revolutions per minute available from the motor itself may be inserted between the output shaft of bidirectional motor 10 and the drive shaft socket 11. In addition any of various torque limiting devices as known in the art may be also inserted between the bidirectional electric motor 10 and drive shaft socket 11..

While I have thus described the preferred embodiments of the present invention, many variations will be apparent to those skilled in the art and it must be understood that the foregoing description is intended to be illustrative only and not limitative of the present invention. All such variations, and modifications as are in accord with the principles described are meant to fall witihin the scope of the appended claims.